

## REMARKS

Claims 1, 4-5, 8, 11 and 15 have been amended. Claims 6 and 7 have been canceled and new claims 17-30 added. Claims 1-6 and 8-30 are pending in this application.

### **I. Rejection of Claims 1-7 and 9 (Neri, Admitted Prior Art and Gardner)**

The office action states that the combination of Neri et al. (US Publication No. 2002/0131062) and Gardner (USPN 6483087) meets the limitations of claims 1-7 and 9. More specifically, Neri '062 is cited for the general teaching of thermal dye printing using an image carrier sheet and a vacuum with a membrane. Gardner '087 is cited for the teaching of a flexible heater, which is not found in the Neri reference. The examiner states that it would have been obvious to combine the two references to arrive at the invention.

As best seen in Fig. 6, Neri '062 teaches the general concept of using a flexible membrane, with the assistance of a vacuum, to secure an image carrier sheet to an object to be printed on. Most importantly, an array of radiation emitters 80 are used to provide the needed heat to effectuate transfer of the image to the surfaces to be printed on. These emitters 80, as disclosed in the Neri '062 publication, are arranged in a U-shaped configuration to generally provide as uniform as possible heat to all sides to be printed on so a high quality image can be transferred. Individual heating elements 80 are provided in Neri '062. As can be understood, these heater elements 80 can only generally approximate the contour of the surface to be printed on. In fact, Neri '062 itself is an improvement over the prior art that merely provides a single source of heat, namely, from the top of the object to be printed on.

The present invention takes the invention in Neri '062 a significant and inventive step further by providing a flexible heater element that actually changes its shape (the delivery of

heat) to conform to the shape of the object to be printed on. Where Neri '062 only approximates the delivery of three dimensional heat to the object and flexible membrane for printing, the present invention provides precise heat to the object and flexible membrane so that uniform heat is delivered. This is not possible with the invention in Neri '062. Moreover, Neri '062 requires adjustment to the U-shaped array to best suit the object to be printed on. In contrast, the method of the present invention permits the position of the heat source to be customized on the fly for each object to be printed on. This can only be realized with the flexible and conformable heater element in the form of an etched circuit that is set forth in the claims of the present invention.

The office action suggests that Gardner could be combined with Neri '062 to arrive at applicant's unique invention. However, Gardner focuses on a flexible heater with no concern for dye printing, as required by the present invention. Gardner fails to teach a photochemically etched substrate to provide an electric circuit to serve as the flexible heating member. Gardner's teaching is very limited to providing parallel strips of metal, such as copper, within a laminate to provide a heater element. Applicant submits that Gardner can flex better in a direction parallel to the strips but not across the strips. While the heater in Gardner is flexible it is not suitable for being flexed over multiple surface, particularly under the force of a vacuum.

However, applicant's flexible heater is photochemically etched from a substrate of, for example, fabric (as in Figs. 2B, 2C and 2d) to provide a custom heater circuit, which can be dimensioned to the object to be printed while considering the stresses and regions of folding during the step of conforming it to the object along with the image carrier sheet. This is not at all possible with Gardner. It should be noted that claim 7 has been canceled as its limitations

have now been incorporated into claim 1. The limitations of claim 6 were also incorporated into independent claim 1.

Further, the examiner is treating their obviousness analysis as if applicant has submitted apparatus claims. However, applicant's claimed invention is for a *method* of printing not an end apparatus. The prior art is completely devoid of using a photochemically etched heater element as applicant has done to conform for uniform heating for transfer printing. If Neri '062 were to employ the flexible heater element of Gardner, it would provide it in a U-shaped configuration positioned a distance away from the object to be printed, the image carrier and flexible membrane. Neri '062 is devoid of a teaching or suggestion *to conform* a heater element to the contour of the object to be printed. The step of "establishing a vacuum under the membrane to cause the image carrier sheet and flexible heating element to conform into pressurized communication with the top surface and side surfaces of the three dimensional object" in claim 1 of the instant application is notably missing from Neri '062 and Gardner, either alone or in combination.

Therefore, applicant submits that the combination of Neri '062 and Gardner fails to meet the limitations in claim 1. The examiner's combination of Neri '062 and Gardner is clearly the result of hindsight reconstruction of applicant's invention. There is no teaching or suggestion in either Neri or Gardner to support the combination as understood by a person of ordinary skill in the art.

Claims 1-7 and 9 are dependent on now allowable claim 1. Therefore, applicant submits that claims 2-7 and 9 are now also allowable over the prior art.

## **II. Rejection of Claims 1-7 and 9 (Neri, Admitted Prior Art and Gardner)**

The office action states that the combination of Neri et al. (USPN 7267737) and Gardner (USPN 6483087) meets the limitations of claims 1-7 and 9. More specifically, Neri '737 is cited for the general teaching of thermal dye printing using an image carrier sheet and a vacuum with a membrane. Gardner '087 is cited for the teaching of a flexible heater, which is not found in the Neri reference. The examiner states that it would have been obvious to combine the two references to arrive at the invention.

Neri '737 is an issued patent based on a divisional of the application published as the Neri '062 publication. Therefore, the disclosure of Neri '737 and Neri '062 are identical. Accordingly, applicant incorporates herein all of the arguments above in Section I herein.

As stated above, claims 1-7 and 9 are dependent on now allowable claim 1. Therefore, applicant submits that claims 2-7 and 9 are now also allowable over the prior art.

## **III. Rejection of Claims 1-7 and 9 (Hastie, Neri, Admitted Prior Art, Gardner)**

The office action states that the combination of Hastie et al. (WO 01/96123) in view of Neri et al. '062 and Gardner '087 meets the limitations of claims 1-7 and 9. More specifically, Hastie is cited for the general teaching of thermal dye printing using an image carrier sheet and a vacuum with a membrane. However, the office action states that Hastie does not teach printing to a three dimension surface. Neri '062 is cited for printing to a three dimensional surface. Neither Hastie or Neri teach the use of a flexible heating element. Gardner '087 is cited for the teaching of a flexible heater and the office action states that it would have been obvious to combine the references to arrive at the invention.

For the reasons stated above, Neri '062 fails to teach the method steps of actually conforming a heater element to the contour of a object to be printed on. The arguments in Section 1 are incorporated herein. The addition of Hastie to the combination of references fails to render applicant's claimed method obvious. Hastie discloses the use of hot air blown over the transfer element as a way to provide "reasonably even heat over the article". See page 10 of Hastie. This method is substantially different than applicant's invention that uses a flexible heating circuit that closely conforms to the contour of an article to be printed on. Applicant's method delivers heat in a much more uniform fashion because of this step of conforming it to the object with the image carrier sheet by the flexible membrane.

In view of the foregoing, the citation of Hastie is insufficient to provide a combination with the other cited references to render applicant's invention obvious under Section 103. Applicant submits that claim 1 is patentable over the cited prior art.

As stated above, claims 1-7 and 9 are dependent on now allowable claim 1. Therefore, applicant submits that claims 2-7 and 9 are now also allowable over the prior art.

#### **IV. Claim 8 (Neri, Admitted Prior Art, Gardner, Kitigawa)**

The office action states that the combination of Neri et al. (US Publication No. 2002/0131062), Gardner (USPN 6483087) and Kitigawa meet the limitation of claim 8. More specifically, Neri '062 is cited for the general teaching of thermal dye printing using an image carrier sheet and a vacuum with a membrane. Gardner '087 is cited for the teaching of a flexible heater, which is not found in the Neri reference. Neither Neri '062 or Gardner '087 teach the use of an electrically-insulating lacquer layer. Kitigawa is cited for the teaching of such

a lacquer layer. The examiner states that it would have been obvious to combine the references to arrive at the invention.

Claim 8 is dependent on now allowable claim 1. Therefore, applicant submits that claim 8 is now also allowable over the prior art.

**V. Claims 11 and 12 (Neri, Geary, Admitted Prior Art)**

The office action states that the combination of Neri et al. and Geary (USPN 3956552) meets the limitation of claims 11 and 12. It should be noted that the office action fails to specify which Neri et al. reference is being cited for this rejection. The applicant assumes that the examiner is referring to US Publication No. 2002/0131062 but it cannot be certain. Therefore, the examiner is requested to clarify which reference is being cited and that the next action be non-final, if the application is not allowed.

The Neri reference is cited for the general teaching of thermal dye printing using an image carrier sheet and a vacuum with a membrane. However, the office action states that Neri et al. does not teach the use of heating elements with the membrane to transfer a pattern to an object. The examiner cited U.S. Patent No. 3956552, issued to Geary, for the teaching of a heating and vacuum pressurizing using an open mesh cloth to provide flexibility during printing. The office action states that it would be obvious to combine the references to arrive at the invention.

The arguments in connection with Neri 'et al (presumably Neri '062) are incorporated herein. The additional citation of Geary fails to provide a combination that renders applicant's invention obvious. Geary merely teaches a single radiation emitter 35, as in Fig. 7D and col. 5, lines 23-24, to provide the heat source. The examiner's comments on pages 7-8 are misplaced.

In view of this single source of radiation, there is no motivation in Geary to provide a method step of conforming the heater element itself about the contour of the object to be heated. In fact, Geary's disclosure of a single heat source that is positioned a distance away from the object to be printed on teaches away from a method that conforms the heat element. Moreover, Geary teaches the delivery of heat to a flat surface which is completely incompatible with applicant's three dimensional printing. Therefore, Applicant submits that claim 11 is allowable over the art of record.

Also, claim 12 is dependent on now allowable claim 11. Therefore, applicant submits that claim 12 is now also allowable over the prior art.

**VI. Claim 14 (Neri, Geary, Admitted Prior Art, Gibbs)**

The office action states that Neri et al. in view of Geary meets the limitation of claim 14 in combination with Gibbs. This rejection, as above, fails to reference which Neri et al. reference is being referred to. Claim 14 calls for a flexible membrane of silicone rubber. However, Neri and Geary do not teach a flexible membrane made of silicone rubber. U.S. Patent No. 3888719, issued to Gibbs, was cited for the teaching of a flexible silicone rubber press.

Also, claim 14 is dependent on now allowable claim 11. Therefore, applicant submits that claim 14 is now also allowable over the prior art.

**VII. Claims 15 and 16 (Neri and Gardner; Neri, Admitted Prior Art and Gardner)**

The office action states that Neri, the admitted prior art and Gardner et al. teach the limitations of claims 15 and 16. As to claim 15, it is asserted that Neri teaches the invention except for a flexible heating element. Gardner is cited for the teaching of a flexible heater that can be used with Neri et al. As to claim 16, it is asserted that Neri teaches the step of heating

the sheet to make it more flexible after the flexible membrane is lowered over the carrier sheet and prior to establishing a vacuum.

Applicant incorporates herein the arguments made above in connection with Section I, above. For the same reasons, Neri, the admitted prior art and Gardner fails to teach the claimed invention in claim 15, as amended.

Also, claim 16 is dependent on now allowable claim 15. Therefore, applicant submits that claim 16 is now also allowable over the prior art.

#### **VIII. Claims 15 and 16 (Hastie, Neri, Admitted Prior Art and Gardner)**

The office action states that claims 15 is unpatentable over the combination of Hastie '123, Neri '062 and the admitted prior art (Gardner). The office action states that Hastie teaches the invention except for using a flexible membrane to enable printing to a three dimensional surface. Hastie is also devoid of a teaching of the use of a heating element. The office action states that Gardner teaches such a heating element and it would be obvious to use it in a combined method in accordance with Hastie and Neri '062. As to claim 16, the office action indicates that it would be obvious to combine Hastie, Neri et al. and Gardner for the teaching of an image carrier sheet being heated to make it more flexible after it is lowered to the object to be printed on and before the vacuum is established.

Applicant incorporates herein the arguments made above in connection with Section I, above. For the same reasons, Neri, the admitted prior art and Gardner fails to teach the claimed invention in claim 15, as amended.

Also, claim 16 is dependent on now allowable claim 15. Therefore, applicant submits that claim 16 is now also allowable over the prior art.



**IX. Allowable Subject Matter/New Claims**

The office action stated that claims 10 and 13 were allowable over the prior art. Accordingly, applicant has added new claims 17-30 where claims 17-26 include independent claim 17 that corresponds to a re-written claim 1 with the allowable limitations of claim 10 and claims 27-30 include independent claim 27 that corresponds to a re-written claim 11 with the limitations of allowable claim 13.

Applicant submits that new claims 17-30 are now fully allowable over the prior art. The fee for two additional independent claims and 10 claims over the base of 20 claims is also included.

**X. Conclusion**

In view of the above, Applicants submit that pending claims 1-5 and 8-30 are now in condition for allowance. Reconsideration of the Rejections are requested. Allowance of claims 1-5 and 8-30 at an early date is solicited.

If an extension of time is required for timely submission of this response, Applicant hereby petitions for an appropriate extension of time and the Office is authorized to charge Deposit Account 02-0900 for the appropriate additional fees in connection with the filing of this response or credit any overpayment.

The Examiner is invited to telephone the undersigned should any questions arise.

Respectfully submitted,

/david r. josephs/

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